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1.0 INTRODUCTION

The Lake Washington Ecosystem Restoration General Investigation (GI) Study was initiated in July 1999. The co-sponsors of this study are the City of Seattle and King County. The Lake Washington Basin Restoration GI is evaluating two water related issues in the greater Lake Washington Basin, which includes Lake Sammamish, Lake Washington, and the Cedar River. These issues are: improved salmonid migration and survival at the Hiram A. Chittenden Locks through water conservation and the modification of facilities, and the creation of specific habitat improvements throughout the basin for fish and wildlife. The proposed project is interested in the latter. The City of Seattle Parks Department owns and maintains Seward Park, located in King County along the Bailey Peninsula in southwestern Lake Washington and is interested in rehabilitating habitat within the park under the Lake Washington Restoration GI.

Unlike most systems in which juvenile chinook rear in rivers and estuaries, juvenile chinook in Lake Washington rear in littoral areas of the lake from January to early June. Lake Washington and to some degree Seward Park are a highly altered environment with extensive development along the shoreline. The decline of Puget Sound chinook salmon in Lake Washington suggests that one potential limiting factor on juvenile chinook is the effect of such intensive urbanization on juveniles in the lake. Protection measures placed at Seward Park include a variety of small-scale bank protection and beach nourishment projects (e.g., small riprap, concrete, ornamental concrete walls, sand, gravel) and were intended to decrease the frequency and magnitude of shoreline erosion. In many cases, it appears that bank protection methods have reduced nearshore habitat for fish and wildlife. Piaskowski and Tabor (2001) found evidence that shoreline development such as found along Seward Park (e.g. riprapping, creating steeping and/or deepshoreslines with bulkheading,) may create habitat avoided by juvenile chinook at night. In several areas along the shoreline of Seward Park, quarry spalls have washed out into the nearshore habitat creating an "armored" substrate. Substrate is important because it has potential use as cover, spawning, and feeding habitat for juvenile salmonids. The quarry spalls lack any habitat quality for juvenile chinook salmon but may provide good ambush habitat for several species of sculpins that prey upon juvenile salmon. Piaskowski and Tabor (2001) found evidence in southern Lake Washington that juvenile chinook prefer a sand/gravel substrate and avoidance towards larger substrate (cobble/boulder). The Corps and the City of Seattle theorize that they can improve the nearshore habitat for juvenile chinook salmon by placing a layer of sand/gravel substrate over the present quarry spalls substrate.

This project would be a demonstration project under the Lake Washington Ecosystem Restoration GI. Information gained from this project will be used on future restoration projects throughout the basin. Environmental monitoring will be completed pre and post construction by Roger Tabor of the US Fish and Wildlife Service and Kurt Fresh of the Washington Department of Fish and Wildlife.

2.0 PROJECT DESCRIPTION

2.1 Project location

Seward Park is located along the southwest shoreline of Lake Washington, within the limits of the City of Seattle, Washington. The project will take place at the northeast corner of Seward Park in the City of Seattle, King County, Washington (T 23N, R 4E, S 14). The approximate northern limit of the project would be N 209,046.82, E 1,291,609.65 and the approximate southern limit of the project would be N 208,153.49, E 1,292,059.08.

2.2 Project description/Construction techniques

This rehabilitation measure consists of placing a 1-foot-thick layer of fine and coarse gravels over selected portions of the near shore bottom to cover angular quarry stone left over from previous erosion control projects. The project will consist of placing 700 cubic yards of fine substrate (sand/gravel) along the shoreline and another 700 cubic yards of coarse substrate (coarse gravel) further south along the shoreline. Material would be placed from a barge with the dimensions of each placement would be 500' along the shoreline by 30' width. The thickness of the placed substrate would be one foot (plus or minus about ½ foot). The area proposed for placement is approximately 1000 lineal feet along the east shore. The required quantity of sand, gravel, and cobbles is estimated at 1400 cy or approximately 2,000 tons. The west shore site would be divided into two areas, one for fine grained, sandy material and one coarse gravel and cobbles. The placement method will be one that has been used successfully in the past. This method consists of offloading material from a barge by conveyor. This placement method allows material to be placed accurately and efficiently (Figure 2.2.1).



Figure 2.2.1. Barge offloading substrate material by conveyor belt as proposed as an alternative for use in the Seward Park Rehabilitation Project, King County, Washington.

Table 2.2.1**Habitat Rehabilitation Gradation**

US Standard Sieve Size	Percent Passing by Weight	
	Coarse	Fine
6 inches	100	100
3 inches	50-100	90-100
1 ½ inches		60-90
¾ inches	0-40	
3/8 inches	0-6	
No. 4		40-70
No. 40		15 -45
No. 200	0-3	0-3

Construction of the project would be completed by contract and occur within the fish work window of July 16-December 31. The Corps will work with State, Tribal, and Federal agencies to design a project work window that will allow work during periods where work will have insignificant or discountable effects on listed salmonids.

The contract will be competitively bid, with advertisement and award of the contract to begin as soon as possible after the local sponsor and the Corps obtains all the necessary lands, easements, relocations, rights-of-way, and disposal areas (LERRD) and permits. At this time, construction of the project in December 2001, although the actual date could be earlier or later and depends on when the local sponsor and the Corps obtain the necessary permits. However, construction will definitely take place within the time frame of July 16th - December 31st. Construction of the project is anticipated to occur over 1 -2 days.

3.0 ACTION AREA

The action area includes not only the activity proposed by the Corps but all interrelated and/or interdependent activities. For this project Lake Washington has been determined to be the action area. Lake Washington is a large mesotrophic lowland lake forming the eastern boundary of the City of Seattle, King County, Washington. The lake is the second largest natural lake in the state of Washington, with a width of 1.6 to 6.1 km, a length of 3.4 km, at total surface area of 9,495 hectares (at full pool, 6.71 m above MSL) and a mean and maximum depth of 33 m and 67 m, respectively (Wolcott 1973, Bartoo 1977, Brenner et al. 1990, USACE 1992). The Lake Washington shoreline, 146 km at full pool, is more than 78% developed with very few kilometers of shoreline in parks or other semi-natural privately owned areas (Chrzastowski 1981). Lake Washington also suffers from a limited littoral area, approximately 7.8% of the total surface area and 8.7% of the total volume are between 0-5 m depth (mean pool = 6.4 m) (Ajwani 1956).

Lake Washington drains a watershed of 1,579 km² (607 mi²) and has its outlet at the Lake Washington Ship Canal (Figure 1). The Ship Canal is 13 km long and has a minimum depth of 9.1 m (USACE 1992). The Cedar River, the largest (42 - 53% of total inflow) tributary with an average discharge of 19.9 cms (704 cfs), enters at the southern end of Lake Washington. The second largest tributary is the Sammamish River, draining Lake

Sammamish to the east and entering at the north end of Lake Washington. Sammamish River inflow (mean = 10.4 cms (367 cfs)), comprises 30% of total inflow to lake Washington (Chrzastowski 1981, Solomon 1994). The average water-residence time in Lake Washington is 2.3 years (Edmondson and Lehman 1981).

Inflowing water from the Cedar River is colder and denser than the surface water of Lake Washington during most of the year and thus, tends to sink upon entry to the lake. Inflow from the river enters the lake, settles to a level between the lake surface and the metalimnion and expands horizontally. The prevailing wind direction is predominantly from the south and southwest during the fall, winter, and spring, gusting up to 112 km hr^{-1} (70 mph), while summer winds are generally light and from the north. The combination of wind and Cedar River inflow creates rotating current that provides an overall movement of surface water to the north (CH2M Hill 1975, Solomon 1994). In winter and spring, unmixed Cedar River water may reach as far north as Madison Park during storm events (Edmondson 1991a).

Prior to 1916, the Black River, located at the southern end of Lake Washington, was the main outlet. The Cedar River discharged into the Black River immediately below the lake, and then flowed into the Duwamish River and into Puget Sound. The Lake Washington Ship Canal was dredged to provide navigation from Lake Washington through Lake Union to Puget Sound. The elevation of Lake Washington was also lowered by approximately 2.7 m (9 ft) to that of Lake Union, subsequently the lake now flows through the Ship Canal instead of the Black River channel. The Cedar River was diverted into Lake Washington to maintain the lake level, whereby increasing lake inflow decreased water residence time of Lake Washington (WRIA 1975, Chrzastowski 1981). The Cedar River is regulated by the operation of Cedar Falls Hydroelectric Project, located downstream from Chester Morse Lake, and the annual diversion of approximately 4.8 cms at Landsburg Dam by the City of Seattle Water Department (Stober and Hamalainen 1979).

The elevation of Lake Washington is controlled by the Corps at the Hiram Chittenden Locks (Locks) by regulated outflow through a spillway and lock facility. Throughout the year, the lake level is allowed to fluctuate between 6.09 m (20 ft MSL) and 6.71 m (22 ft) elevation. The lower level (6.1 m) is maintained during the winter for flood storage, to create a "flood pocket" for excess storm water runoff. Lake refill begins on 15 February (6.1 m), and continues until the lake level reaches 6.66 m (21.85 ft), generally in the first week of May. From the first week of May to 31 July, the lake level fluctuates between 6.66 to 6.71 m. Drafting of the lake begins at the end of July, while the average refill rate is 0.007 m per day. Maximum daily extremes of $\pm 0.046 \text{ m}$ in response to flood control situations occasionally occur throughout the winter (M. Valentine, USACE, *pers. comm.*).

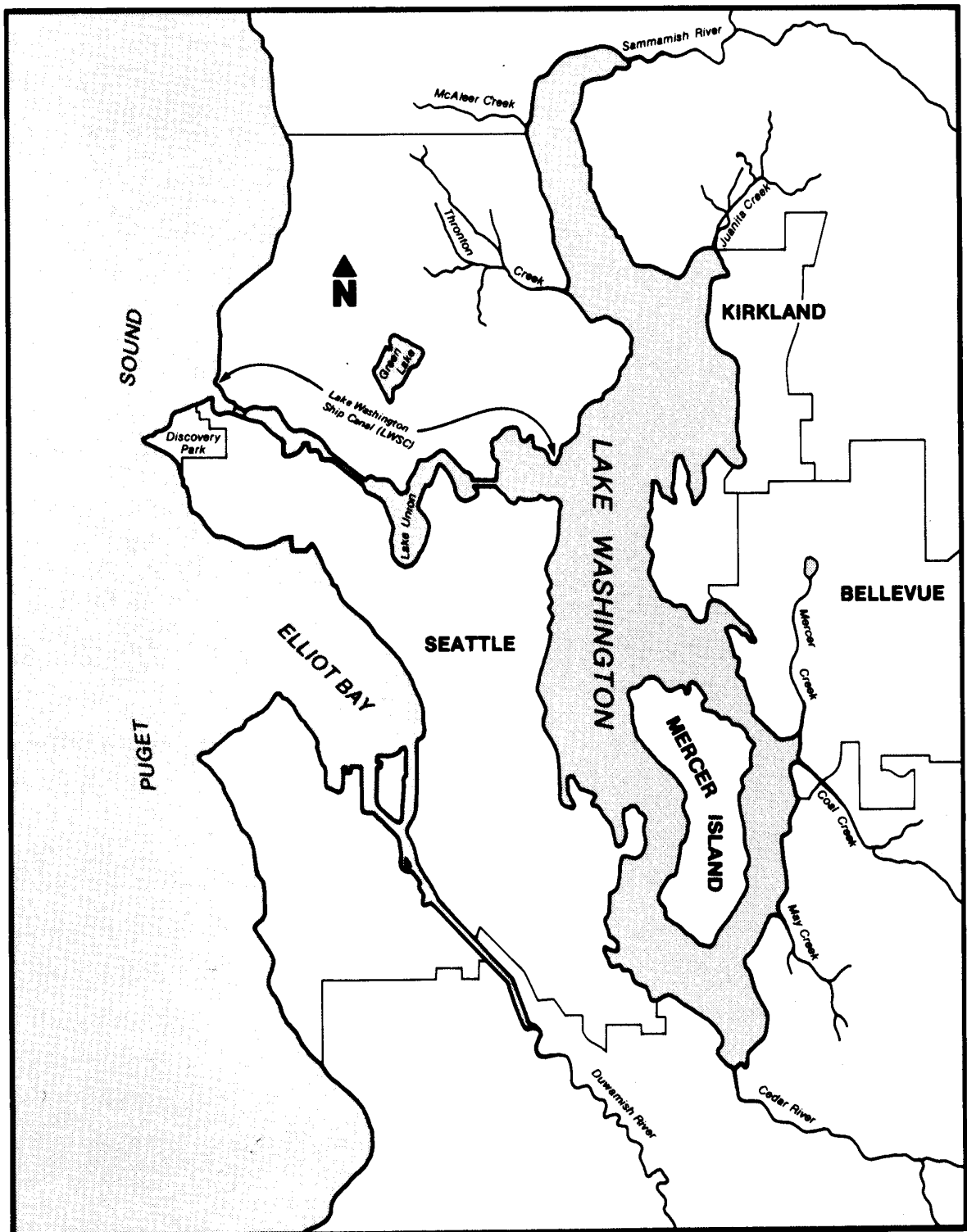


Figure 1. Lake Washington, identifying tributary inflow and outlet to Puget Sound, King County Washington.

3.1 Project Area Seward Park.

Seward Park is located along the southwest shoreline of Lake Washington, within the limits of the City of Seattle, Washington (Figure 3.1). The proposed rehabilitation site is situated on the 200 acre Bailey Peninsula extending from the southwest shore of the lake. (Figure 3). Portions of the Seward Park (Bailey Peninsula) shoreline habitat are composed of medium-sized gravel substrate; however, the banks have been armored in many places with concrete blocks and rock riprap to prevent erosion. Other sections of the shoreline are unarmored and eroding to a moderate degree. Terrestrial vegetation is minimal on the north shore of Seward Park, becoming more dense on the east side. The south shore is armored with a concrete wall (layers of concrete) approximately 0.9 m high (ft) containing solely grass down to waters edge. The wall does not appear to be an effective bank protection measure. The south and east shore of the peninsula are subject to significant wave action from prevailing winds during fall, winter, and spring.

On the north shore, the City constructed a project approximately twenty years ago to nourish the beach with gravel and place two submerged angular-rock berms. This area has not required annual maintenance and has held up well over the years. The outer shoreline along eastern Seward Park is relatively comprised of relatively steep gradient, while the bay inside Seward Park (Andrews Bay) is relatively shallow and well vegetated. Along the north point and the inner shoreline, a gradual shelf extends into Lake Washington for approximately 18-30 m (60-100 ft).

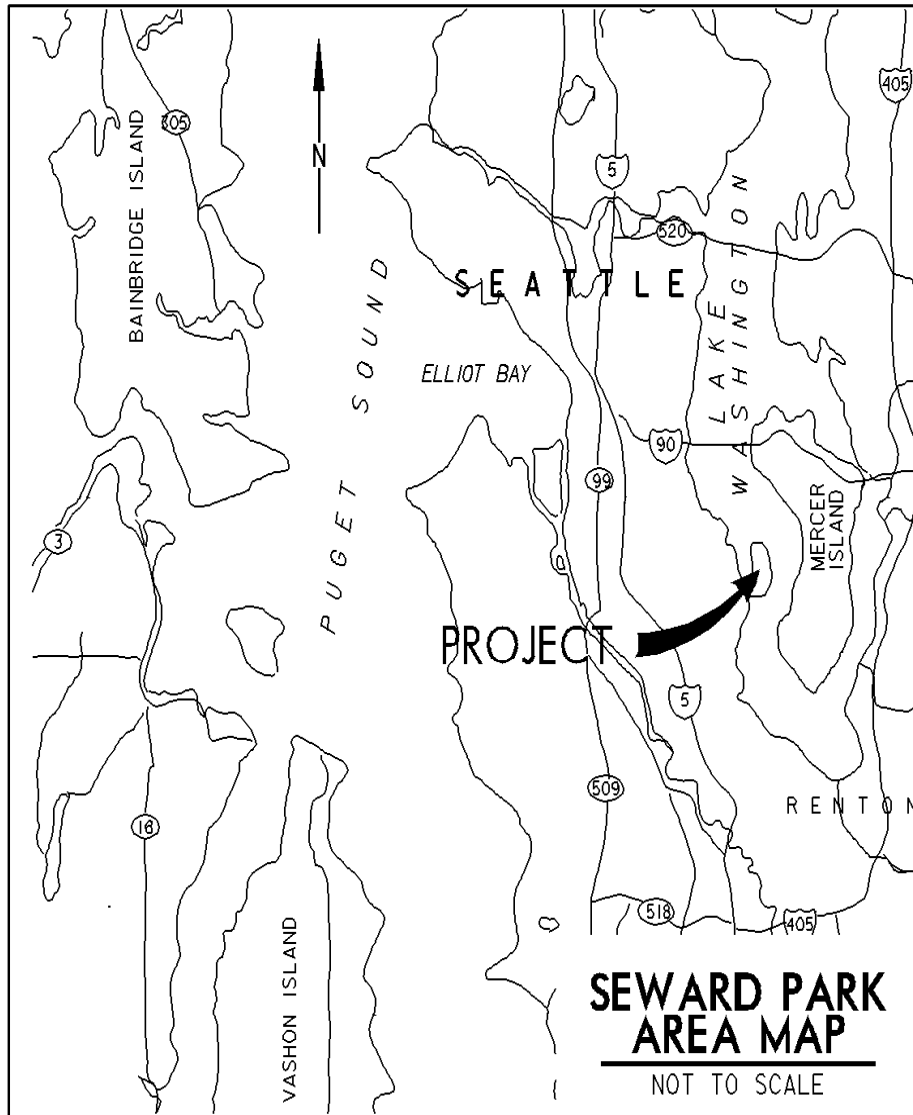


Figure 3.1.1 The proposed Seward Park Rehabilitation Site, King County, Washington.

4.0 SPECIES AND HABITAT INFORMATION

4.1 Species present

The following federally listed or proposed species may be present in the vicinity of the project.

Chinook salmon (*Oncorhynchus tshawytscha*) threatened

Bull trout - (*Salvelinus confluentus*) threatened

Bald eagle - (*Haliaeetus leucocephalus*) threatened

4.2 Species utilization

4.2.1 Status

4.2.1.1 Chinook

The Puget Sound chinook salmon Evolutionary Significant Unit (ESU), including the populations in the Lake Washington Basin, were proposed for listing as threatened under the federal Endangered Species Act on 9 March 1998 (63 FR 11482). Cedar River chinook salmon, along with 28 other stocks, have been placed into the Puget Sound ESU by NMFS (Myers et al. 1998). The Puget Sound ESU encompasses all chinook populations from the Elwha River on the Olympic Peninsula to the Nooksack River in North Puget Sound and south to the Nisqually River. The five-year mean natural escapement (1992-1996) for the Puget Sound ESU is approximately 27,000 spawners; recent total escapement (natural and hatchery fish) has averaged 71,000 spawners (Myers et al. 1998).

Three stocks of chinook are present in Lake Washington: (1) the Issaquah Creek stock, a composite population (utilizing Green River stock) that is at least partially sustained by production from the Issaquah hatchery; (2) the Cedar River stock, classified as native/wild; and (3) the north Lake Washington tributary stock also classified as native/wild. Lake Washington chinook represent approximately 12% of the natural escapement occurring in the Puget Sound ESU. The WDFW listed the status of chinook in the Cedar River as unknown due to unreliable abundance data (WDFW et al. 1994). Summer/fall chinook of the Cedar River basin are distinguished from other Puget Sound stocks by geographic isolation. The stock is native and all production comes from naturally spawning fish. Genetic analysis has not been conducted to date (WDFW et al. 1994). Recent trends in abundance of Lake Washington chinook have declined since 1991. The Lake Washington chinook stock is now considered to be depressed (City of Seattle 1998).

For the past 7-10 years (1987-1996 returns), each of the three Lake Washington stocks has shown a steep downward trend in adult returns. Annually, decline for each run has been greater than 8% with the Cedar River declining at 10.1% per year (5 year geometric mean of 377 fish), North Lake Washington 16.6% (5 year mean of 145 fish), and Issaquah Creek 8.0%. Over a longer time period, the downward trends have been more variable with the Cedar River declining 2.2% (1964-1996) and North Lake Washington 11.1% per year (1983-1996). Of 23 chinook populations in Puget Sound, Lake Washington was among five populations showing the steepest decline (>5% per year) (Meyers et al. 1998).

All trend analysis conducted by WDFW data or NMFS has focused on adult return years from 1996 and earlier. Recent adult returns from 1997 and 1998 have not been incorporated in trend analysis. These two latest years would incorporate some measure of improvements, possibly attributed to increased smolt survival through the Ship Canal and Locks since 1994. Adult returns (run-size counts at the Locks by Muckleshoot Tribe) for these latest two years have averaged approximately 7,500 fish per year, approaching early 1980's run-size totals. However, adult returns are predominantly

hatchery run fish, although recent returns to Bear Creek indicate there may be improvement for some wild stocks in Lake Washington.

4.2.1.2 Bull trout

The coastal/Puget Sound bull trout population segment was listed as threatened under the Endangered Species Act of 1973, as amended (64 FR 16397). A 1998 WDFW study reported 80 bull trout/Dolly Varden populations in Washington: 14 (18%) were healthy; two (3%) were in poor condition; six (8%) were critical; and the status of 58 (72%) was unknown. Bull trout are estimated to have occupied approximately 60% of the Columbia River Basin and presently occur in only 45% of the estimated historical range (Quigley and Arbelbide 1997).

In the past 10 years, only two "native char" have been reported in Issaquah Creek and none have been reported in the Sammamish River (64 FR 16397; 1999; WDFW 1998). The USFWS is not certain that the latter subpopulation is "viable." There is no known spawning subpopulation resident in Lake Washington or Lake Sammamish, however, bull trout have been observed in the fish ladder viewing pool at the Locks as recently as 1997 (F. Goetz, USACE, *pers. comm.*) and isolated reports of bull trout captures in or around Lake Washington occur every few years. A larger juvenile bull trout (~250 mm, 3 year old) was caught in the lower Cedar River in July of 1998 (M. Martz, USACE, *pers. comm.*).

The only likely viable bull trout subpopulation in the Lake Washington watershed is the Chester Morse Reservoir subpopulation. However, the Chester Morse Reservoir subpopulation is above an anadromous barrier and is a glacial relic population (WDFW 1998). The population exhibits an adfluvial life history strategy, although residents could exist in the upper watershed (WDFW 1998). Because all life history strategies can arise from the same population, it is possible that some fish emigrate from the Chester Morse Reservoir to exhibit anadromy or to reside in Lake Washington. Water temperatures in the lower Cedar River may be too high to support a fluvial population (WDFW 1998).

4.2.1.3 Bald eagle

The bald eagle (*Haliaeetus leucocephalus*) is a federally listed threatened species and a threatened species at the state level in Washington. The bald eagle was listed as endangered throughout the lower 48 states in 1978, except for Michigan, Minnesota, Wisconsin, Washington, and Oregon, where it was listed as threatened. In 1995, bald eagle populations in other states were downlisted from endangered to threatened by the U.S. Fish and Wildlife Service. In Washington State, the number of active bald eagle nests has increased steadily since 1980, and now numbers over 550 (WDFW 1997 c). However, for unknown reasons, reproductive rates in the Hood Canal and Lower Columbia River areas remain below the target level of one young per nest per year.

Bald eagles are present year-round throughout Washington. Most nesting in the state occurs on the San Juan Islands and along the Olympic Peninsula coastline. Bald eagles have been documented to nest in the vicinity of the Cedar River Municipal Watershed, and along Lake Washington and Lake Sammamish (Smith et al. 1997). Several nests of

bald eagles occur within the city limits of Seattle including one at Discovery Park (Smith et al. 1997; Craig Lykins, Corps, pers. comm.). Recent nest activity has been observed near Woodland Park north of the Ship Canal (K. Brunner, Corps, pers. comm.). Primary wintering areas include the Olympic Peninsula, the San Juan Islands, Puget Sound and its tributaries, Hood Canal, the Cowlitz and Columbia Rivers (Taylor 1989), and rivers of the western Cascade slopes (e.g., Skagit River). Bald eagles are observed within the Seattle metropolitan area throughout the year.

4.2.2 Utilization of action area

4.2.2.1 Chinook

Lake Washington Basin chinook are relatively well-matched with the description for "ocean-type" chinook (Myers et al. 1998). In general, ocean-type fish move relatively rapidly through fresh water into coastal or estuarine rearing areas, compared to their stream-type counterparts (63 FR 11482; Wydoski and Whitney 1979). However, they no longer have access to their historical estuary, the Duwamish River. Chinook, more than most salmon species, have a variety of coping mechanisms that allow adaptation to changing environment, in particular they have a wide-variety of early life-history rearing strategies, reflected by variation in river (or lake) residence time, size at time of migration, and timing of migration. The ocean-type chinook in Lake Washington typically begin their downstream migration as sub-yearlings (Myers et al. 1998). However as a group, fall/summer chinook exhibit many variations in juvenile life history patterns (Healey 1991). Five different juvenile chinook salmon life history strategies are suggested by Reimers (1971):

- Emergent fry move directly downstream and into the estuary within a few weeks;
- Juveniles rear in the main river or remain in tributaries until early summer, emigrating into the estuary for a short rearing period before entering the ocean;
- Juveniles rear in the main river or tributaries until early summer, then emigrate into the estuary for an extended rearing period before entering the ocean in autumn;
- Juveniles rear in the tributary streams, or in the main river, until autumn rainfall begins before they emigrate to the ocean; and
- Juveniles remain in tributary streams, or in the main river, through the summer, rear in the river until the following spring, and enter the ocean as yearlings.

Juvenile chinook from the Cedar River enter Lake Washington over an extended period ranging from January through mid-July (WDFW and USACE unpublished data). However, evidence that most juvenile chinook begin entering the lake in early January and are leaving Lake Washington as smolts by early July, suggests that juvenile chinook in the lake are exhibiting a "ocean" life history (Reimers 1971). Juvenile chinook migration in the Cedar River has at least two distinct nodes. A large percentage (~70%) of juvenile chinook migrate downstream to Lake Washington as fry (40-45 mm FL) in late March and early April. The early downstream migration of newly emerged fry is probably a dispersal mechanism that helps distribute fry among downstream rearing habitats (Lister and Genoe 1970). A second node of fish (~20%) move downstream to Lake Washington at approximately 80 mm FL in late May and early June (termed 90-day fry) (M. Martz, USACE, *pers. comm.*). Lister and Walker (1966) observed a similar

bimodal distribution of chinook fry in the Big Qualicum River, British Columbia. They found that chinook fry migrated either within a short time of their emergence or after six weeks or more of rearing. The early group of fry measured 40-48 mm in length and migrated downstream during late March and April. A later pulse of fry migrated downstream during May and early June and measured 60-90 mm in length. The wide variation in outmigrant size may indicate that some fish are rearing in the river while others are entering and rearing in the lake (Table 4.2.2.1).

Table 4.2.2.1 Mean monthly size (mm FL) of emigrating chinook salmon juveniles captured in the lower Cedar River, Washington, 1998 (adapted from D. Seiler; WDFW; unpublished data).

	Survey Month					
	Jan	Feb	Mar	Apr	May	Jun
Size (mm)	40	40	43	61	75	96

Haw and Buckley (1962) reported extended freshwater rearing of juvenile chinook in Lakes Washington and Sammamish, with age-1+, and -2+ smolts representing 21% and 12% of sampled returning adults, respectively. The majority of age-0+ chinook juveniles in the Lake Washington watershed leave the lake by mid-summer; 66% of the returning adults sampled by Haw and Buckley (1962) had been age-0+ smolts. Tabor and Chan (1996) captured two juvenile chinook yearlings (234 and 280 mm FL) in south Lake Washington in March 1995. Although it is not known whether these yearlings reared in the lake or in a tributary, their larger size is typical of lake-rearing fish. The appearance of small numbers of age-1+ and 2+ chinook juveniles in Lake Washington provides additional evidence that extended freshwater rearing is occurring in Lake Washington. Lake Washington chinook are fairly atypical by chinook standards whereby they have an extended period of lake-rearing; the only other known stocks in Washington with possible lake rearing demographics include Lakes Quinault and Ozette. Outside Washington, the Wood River in Alaska has a chain lake system that would indicate a significant amount of lake-rearing potential. Based on historical information, most juvenile chinook migrate through the Locks to Puget Sound later than most other river systems, passing the project from late May through July (Table 4.2.2.2). The beginning and end of the chinook outmigration season appears to vary less than the timing of the peak of downstream migration (Healey 1991).

Table 4.2.2.2 Historical emigration timing of chinook salmon smolts at the Chittenden Locks, Seattle, Washington (source = Woodey 1967; 1969; 1970; Traynor 1971).

	Chinook Salmon					Mean	Cumulative
	Catch hr ⁻¹	Catch hr ⁻¹	Catch hr ⁻¹	Catch hr ⁻¹	Catch hr ⁻¹	Weekl y	
Date	1967	1969	1970	1971	Mean	Monthl y	
31-Mar	N/A	0.00	N/A	N/A	0.00	0.0%	0.0%
5-Apr	N/A	0.00	0.00	N/A	0.00	0.0%	0.0%

12-Apr	N/A	0.00	N/A	N/A	0.00	0.0%		0.0%
19-Apr	0.00	0.00	0.00	0.00	0.00	0.0%	0.0%	0.0%
26-Apr	0.00	0.00	0.00	0.00	0.00	0.0%		0.0%
3-May	0.00	0.00	0.00	0.00	0.00	0.0%		0.0%
10-May	4.00	3.39	2.29	0.00	2.42	3.4%		3.4%
17-May	0.00	1.65	0.86	1.03	0.89	1.2%		4.6%
24-May	0.00	0.43	0.00	0.63	0.27	0.4%	6.3%	5.0%
31-May	1.00	0.52	1.06	1.00	0.90	1.3%		6.3%
7-Jun	6.60	5.33	N/A	0.50	4.14	5.8%		12.1%
14-Jun	3.70	N/A	N/A	11.16	7.43	10.4%		22.5%
21-Jun	2.80	N/A	N/A	1.44	2.12	3.0%	53.0%	25.5%
28-Jun	24.00	N/A	N/A	N/A	24.00	33.7%		59.2%
5-Jul	13.00	N/A	N/A	N/A	13.00	18.3%		77.5%
12-Jul	8.00	N/A	N/A	N/A	8.00	11.2%	40.8%	88.8%
19-Jul	8.00	N/A	N/A	N/A	8.00	11.2%	100.0%	100.0%
Mean	1.81	1.03	0.53	1.58	1.40			

After entering Lake Washington, early migrants are typically small in size and inhabit the near-shore littoral zones as they approach smolt-size (Martz et al. 1996). Surveys of both the limnetic and littoral zones of Lake Washington have indicated that from early February through late May, young-of-the-year chinook occupy the littoral zone exclusively (Warner and Fresh 1999). Yearling and older chinook (monthly mean FL = 256-323 mm) were captured in littoral gill nets (2-8 m deep) in all regions of Lake Washington from January through October in 1984-1985 (D.Beauchamp, Univ. of Washington, *unpublished data*). They feed primarily on aquatic insects (chironomid pupae) (K. Fresh, WDFW, *pers. comm*) and terrestrial insects (Wydoski and Whitney 1979; Tabor and Chan 1996), while Rondorf et al. (1990) found that in a Columbia River reservoir, the diet of juvenile chinook salmon consisted primarily of zooplankton and terrestrial insects. Juvenile chinook adapt to local prey abundance by modifying their selection of prey items (Rondorf et al. 1990).

Chinook juveniles, predominantly large individuals, begin appearing in limnetic sampling gear in late May and June in Lake Washington (Martz et al. 1996). Increasing utilization of the limnetic zone may be an ontogenetic response, a response to increasing temperatures in the littoral zone, or merely represent the capture of outmigrating smolts. The distribution and residence time of juvenile chinook in Lake Washington may be influenced by temperature. Bjornn and Reiser (1991) reported the preferred temperature for chinook as 12-14°C, and temperatures from 23-25° C could be lethal and were actively avoided.

Based on physiological studies, ocean-type chinook are usually fully smolted at 65-70 mm FL. At the Locks, the point of physical separation of freshwater Lake Union from

saline Puget Sound, larger chinook smolts have historically (1967) and recently (1998) been captured compared to other river basins (1967 mean = 110.2 mm (range = 82-137 mm) and 1998 = 105 mm) (J. Woodey, Univ. of Wash., *unpublished data*; E. Warner, Muckleshoot Tribe, *pers. comm.*).

As in other systems, a number of factors affect the survival of Lake Washington chinook salmon, including loss and degradation of stream habitat resulting from a variety of land and water management practices; predation by native and introduced species in river and lake; injury to juvenile fish exiting the lake via the Locks; droughts; floods; over-harvest; and unfavorable ocean conditions. The highly modified environment at the marine-freshwater interface downstream of the Locks creates an additional puzzle. The environment is much different than the natural estuary that was present at the mouth of the Duwamish River. Numerous sources (as cited in Healy 1991) have reported on the importance of estuarine rearing for juvenile ocean-type chinook salmon. The behavior, growth, and survival of juvenile ocean-type chinook salmon in the ship canal downstream of the Locks has not been well studied. However, it seems clear that this environment provides much less favorable conditions than the original estuary at the mouth of the Duwamish River.

4.2.2.2 Bull trout

In Washington, bull trout spawning activity was most intense at 5-6°C (Wydoski and Whiting 1979) and occurs primarily at night (Heimer 1965; Weaver and White 1985). Beach spawning of native char in Lake Washington and Lake Sammamish is improbable. Confirmed observations of beach spawning bull trout are limited to extreme downwelling conditions in cold, high-elevation lakes (WDFW 1998); water temperatures in Lake Washington and Lake Sammamish are too high for successful incubation.

4.2.2.3 Bald eagle

Suitable habitat for bald eagles includes the presence of accessible prey and trees for nesting and roosting. The availability of adequate, non-contaminated food resources is an important determinant of bald eagle nest and territory distribution, and wintering habitat (Stalmaster 1987; Keister et al. 1987). Important food items during the breeding season include fish, small mammals, waterfowl, seabirds, and carrion (Anderson et al. 1986; USFWS 1986). Carrion, such as “spawned out” salmon (carcasses), also comprises an important part of the fall and winter diet for bald eagles (Stalmaster et al. 1985). Foraging habitat is usually within a short distance of nesting and perching sites during the breeding seasons, but may be a longer and more-variable distance from winter roosting sites. The most common foraging habitats for bald eagles are lakes, rivers, and ocean shorelines (Stalmaster 1987).

Perch trees, used by adults and fledged young for resting and searching for prey, are important components of bald eagle habitat. Perch trees are usually large and located close to open water or the nest tree (Stalmaster 1987). Snags are often used for perching. Wintering habitat typically includes daytime perches in close proximity to an abundant food source (e.g., anadromous fish runs, waterfowl concentration areas) and communal night roosting areas (USFWS 1986).

Anadromous salmonids are assumed to be an important food source for bald eagles throughout the Lake Washington watershed: though a pair of bald eagles that regularly winters at Green Lake feeds primarily on waterfowl and American coots (K. Brunner, Corps, pers. comm.).

4.3 Survey Results

Two surveys have been conducted in the near vicinity of the project area. In order to determine fish use of the project area a year long survey from September 1999 to August 2000 was conducted (Paron and Nelson 2000). Beach seine surveys and snorkel surveys were used to determine monthly changes in diel distribution and abundance of salmon fry, overyearlings, and potential predators in the nearshore area of Seward Park. A spawning survey was conducted in the first 15 m of wetted nearshore habitat around Seward Park during the Fall of 1999. Three different visual techniques (snorkeling observations, boat observation, and helicopter observation) were used in an effort to locate potential shore spawning sockeye salmon and/or redds.

The study results found that all five salmon and trout species present in Lake Washington watershed (not including whitefish) are present in the project area in the spring. Combined, sockeye, coho, chinook, rainbow trout, and resident cutthroat trout comprised less than 10% (167) of the total beach seine catch of 2,770 fish at Seward Park (Figure 10). Three-spine stickleback (80.14%) was the most frequent species captured, followed by *Cottus spp.* (6.03%) and peamouth chub (5.92%). Sockeye (2.31%) and rainbow trout (1.73%) were the most frequently observed salmonid during beach seine surveys. There was not a significant difference between day and nighttime beach seine catches (T-test; $p = 0.273$), however the power of the performed test was low (0.092) because of a small (3) sample size.

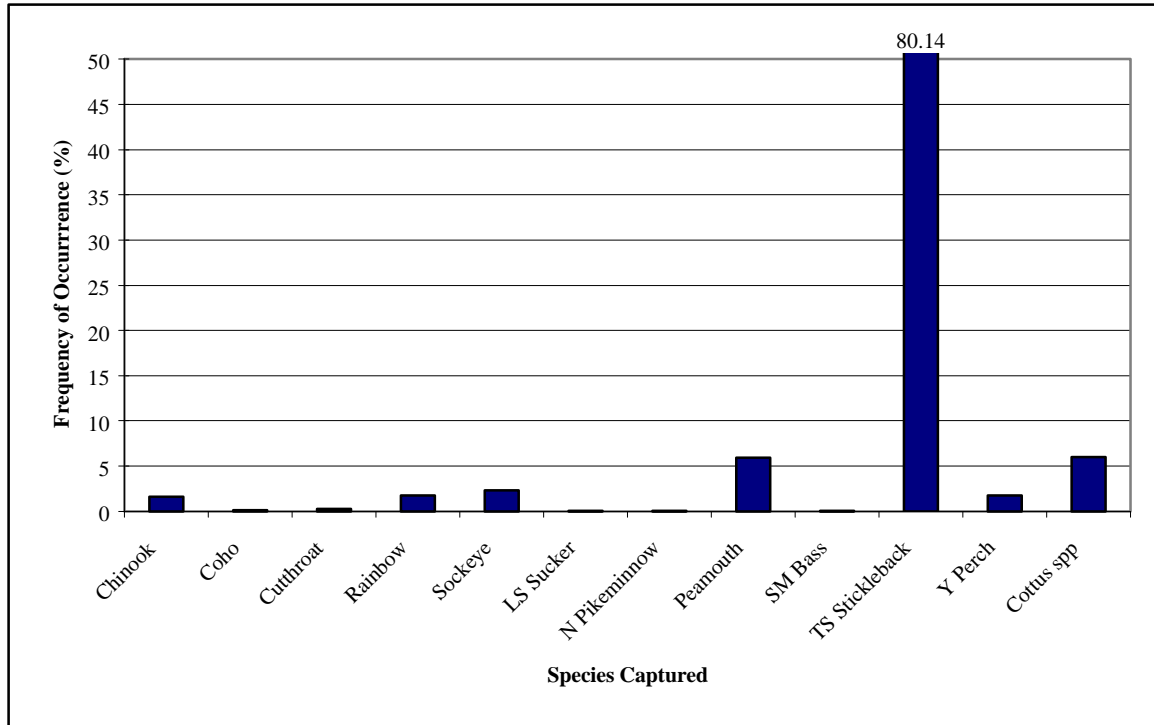


Figure 4.3.1 Frequency of occurrence of fish species captured in beach seines conducted along Seward Park, King County, Washington, 2000.

Combined, 2,806 fish were observed during day and nighttime (paired) snorkel surveys conducted along Seward Park during 1999 and 2000. Except on the first two survey occasions (26 Aug 99 and 24 Sep 99) snorkel surveys were conducted at each site in a paired (day and night) manner (Table 10). Three-spine stickleback comprised the largest (37%) percentage of fish observed during snorkel surveys (Figure 11). Peamouth chub (30%) and *Cottus spp.* (24%) were the next most frequently observed fish during snorkel surveys. Again, sockeye (5%) were the most abundant salmonid captured, followed by chinook (1%) and coho (1%) salmon. Combined, salmonids comprised 6.78% (191) of the total fish observed during snorkel surveys. More than 68% of the total number of fish observed during snorkel surveys occurred on 19 April 2000 (25%; n=701) and 24 May (43%; n=1,218). The species composition was again, heavily dominated by three-spine stickleback and peamouth chub (Figure 12). Sockeye numbers peaked during snorkel surveys conducted on 19 April 2000 (n=40) and 24 May (n=38), which correspond to 31% (19 April) and 29% (24 May) of the total number (129) sockeye observed throughout the paired snorkel surveys. There was not a significant difference in the mean number of salmonids observed between day and nighttime survey events (Mann-Whitney Rank Sum Test; $p=0.341$); however, there were significantly (Mann-Whitney Rank Sum Test; $p=0.015$), more fish observed at night when all fish observed during paired snorkel observations were used in the comparison.

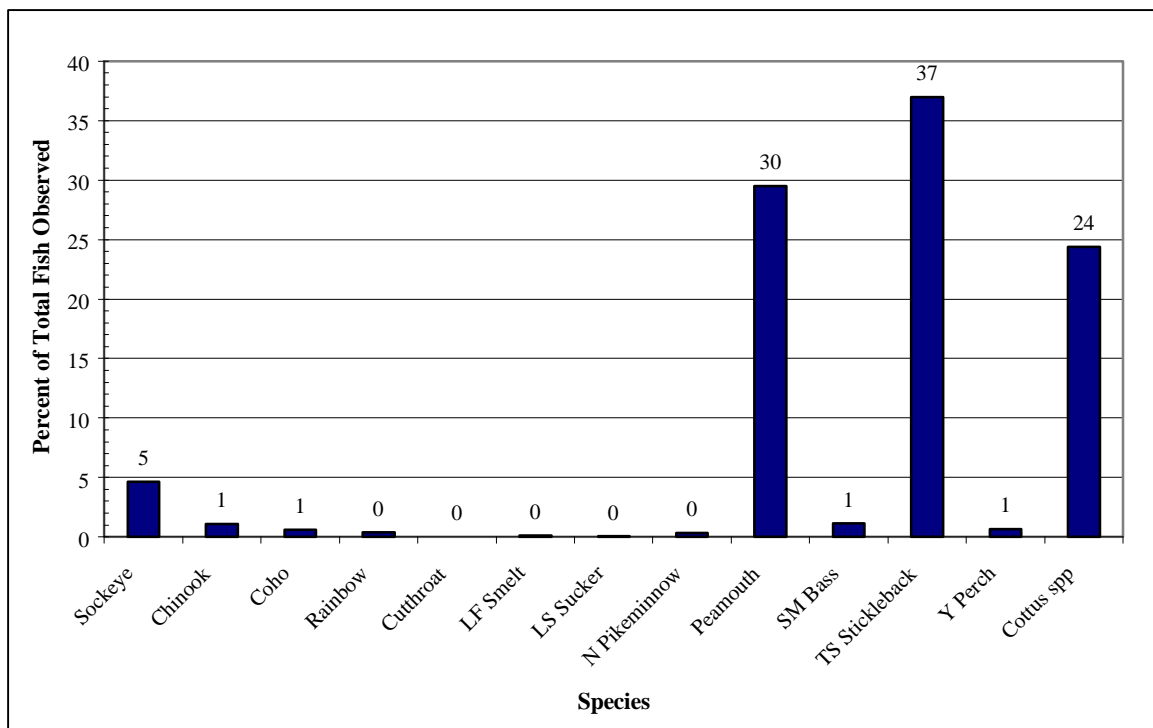


Figure 4.3.2 Frequency of occurrence of fish species observed during paired snorkel surveys conducted along Seward Park, King County, Washington, 1999-2000.

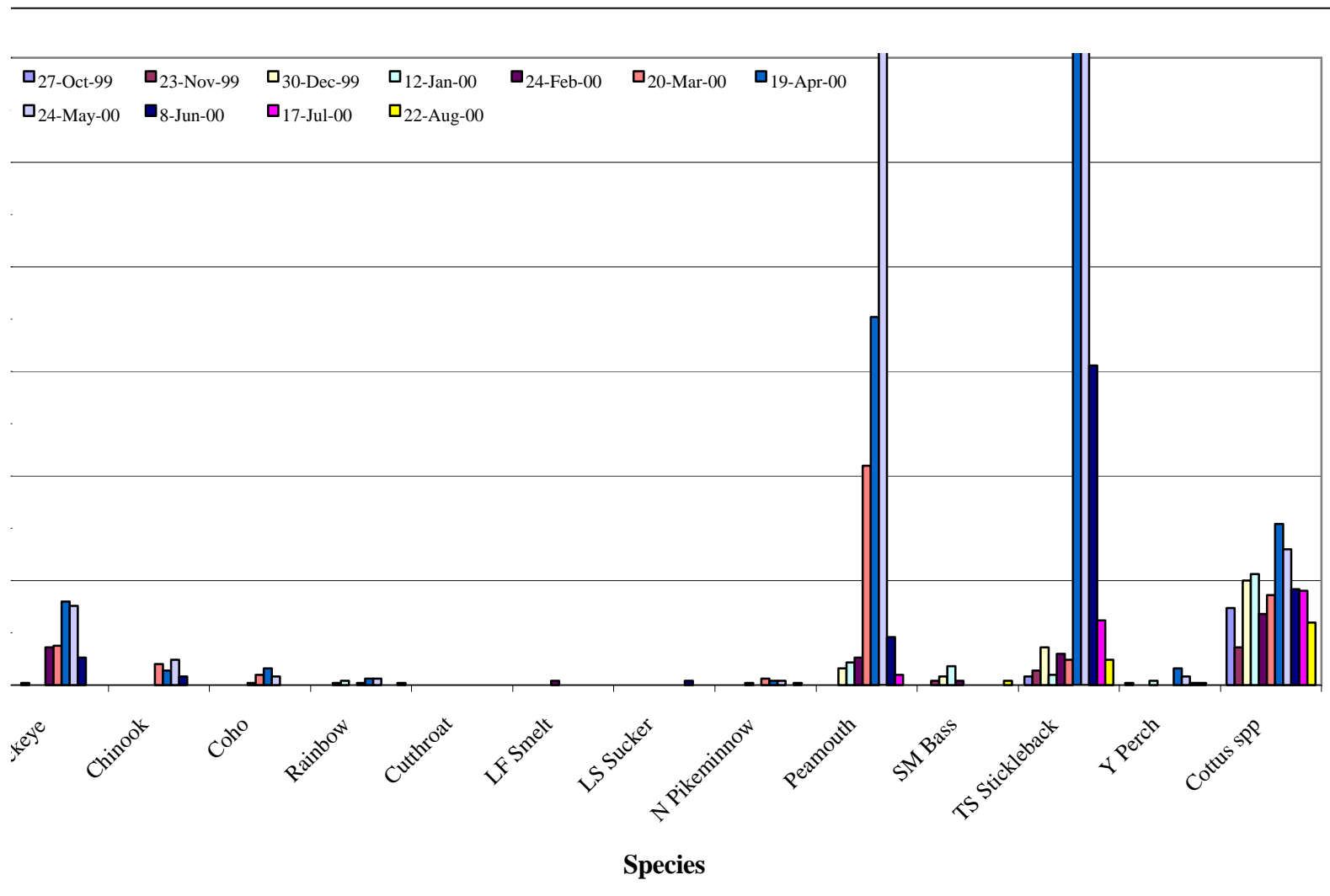


Figure 4.3.3 Number of fish observed during paired snorkel surveys conducted along Seward Park, King County, Washington, 1999-2000.

The study did not observe enough juvenile salmonids of each species, so it grouped all juvenile salmonids together for the following analyses. As previously mentioned, diel habitat use of juvenile salmonids was not significantly different (Mann-Whitney Rank Sum Test; $p=0.3405$), thus the day and nighttime observations were grouped together to form a mean value of juvenile salmonids for each site on each survey day. However, more juvenile salmonids were observed at night (173) compared to daytime (18) observations (Figure 4.3.4).

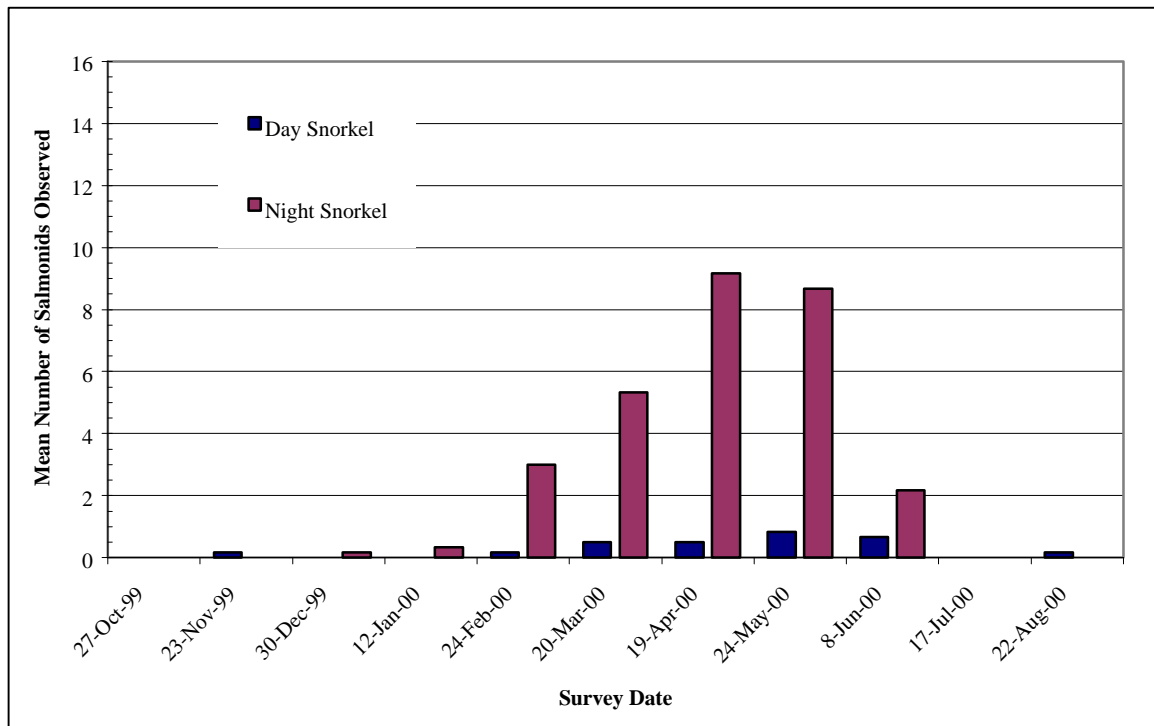


Figure 4.3.4 Mean number of juvenile salmonids observed during day and night snorkel surveys conducted along Seward Park, King County, Washington, 1999-2000.

A single sockeye redd was observed from helicopter on 16 December 1999 on the southwest shoreline of Bailey Peninsula. Divers confirmed the redd on 30 December 1999 during snorkel observations. The redd was constructed in gravel substrate near large woody debris in approximately 0.8 m (2.6 ft). The presence of adult sockeye carcasses on the beach throughout October, November, and December indicates that some deepwater (>4.5 m; 15 ft) spawning may be occurring along the Bailey Peninsula, however the studies survey techniques did not adequately survey these habitats.

Another survey would be a survey the Corps performed looking at the early lake life of sockeye salmon fry in Lake Washington during 1994 and 1995 (Martz et al. 1996). The study looked at the early lake life (defined as the first several months of lake residence) of sockeye fry over two years, investigating several aspects of their ecology including diet, growth rates, mortality, predators, abundance, and horizontal and vertical distribution. The focus of this report discussed preliminary data collected concurrently with the study protocol evaluation, horizontal and vertical distribution, abundance, growth rate, competitor and predator populations. Martz et al (1996) sampled 11 different locations throughout Lake Washington. One site (Site 10) was located on the East Shore of Seward Park at the approximate location of the proposed substrate enhancement project area.

Martz et al. (1996) found that the majority of the sockeye fry captured throughout Lake Washington occurred in the limnetic zone which concurred with previous studies. To their surprise however, a large proportion of the limnetic fry were captured below 20 m during nighttime surveys which contrasted to the results obtained by (Narver 1970) and Woodey (1972) who determined that sockeye fry foraged at night above the 15 m range during spring and summer. A small percentage of sockeye fry did utilize the Lake Washington littoral zone, however. It appears that sockeye fry utilize this habitat type early upon their entry into Lake Washington. Sockeye fry are hypothesized to use littoral zones at night for the first month and then move into deeper limnetic habitat as they grow larger. Overall, there was not a significant difference between day and night catches of sockeye fry in the littoral zones of Lake Washington (Table 4.3.5) (Martz et al. 1996). More sockeye were captured in the littoral areas during nighttime surveys early in the migration season (February and March), however. The authors hypothesized that the majority of these fry had recently immigrated from the Cedar River. Littoral areas also provide a substantial portion of the habitat available to recently emerged beach spawning sockeye fry. Historically, this component of the sockeye population in Lake Washington was comprised of 3,000-9,000 spawning sockeye. Numbers of beach spawning sockeye have decreased recently, but remain a valuable element to the population.

Table 4.3.5 Seine catch at Seward Park, Seattle, Washington, 1994-1995. Species abbreviation are as follows: Sock = sockeye; Chin = chinook; RBT = rainbow trout; CTT = cutthroat trout; Pea = peamouth chub; YP = yellow perch; Smelt – longfin smelt; PM = northern pikeminnow; LS = largescale sucker; TS = three-spine stickleback; Sun = unidentified sunfish/bluegill; Cott = unidentified sculpin (source = Martz et al. 1996).

Date	Sock (fry)	Sock (smolt)	Coho	Chin	RBT	CTT	Pea	YP	Smelt	PM	LS	TS	Sun	Cott
1994														
14 Feb (day)						1								30
14 Feb (night)		2								13				12
15 Mar (day)	8			2			1			1				15
19 Apr (day)												1		17
17 May (day)	1			1			24	11				67		15
1995														
6 Feb (night)	8				1			1	5	5		8		34
27 Feb (night)	3						1	1		2		1		37
28 Mar (day)										6		1		20
22 Mar (night)		11	1			1				7		7		11
2 Apr (night)		17		1		1				6		433		15
18 Apr (night)		4	2	2			1			2		115		
21 Apr (day)	3	1		5								1		
9 May (night)				1	1		147	29				788		43
19 May (day)		7		10	17		350	25				150		
30 May (night)			1		46		31	80		14	7	99	1	64
19 Jun (day)					13			6		4	9	25	8	2
19 Jun (night)					34			8		31	1	77	3	82

5.0 EXISTING ENVIRONMENTAL CONDITIONS (ENVIRONMENTAL BASELINE)

5.1 Vegetation

The shoreline vegetation consists of mowed grasses and blackberry without overhanging vegetation. Milfoil is present approximately 10 m off-shore. Milfoil appears to achieve its maximum annual biomass during the months of July through September (Paron and Nelson 2000). Milfoil is primarily between the depths of 2-6 m.

5.2 Substrate

In the project areas along the shoreline, angular quarry spalls have washed out into the nearshore habitat creating an "armored" substrate. The quarry spalls are present up to 3 m off-shore. A 50% mixture of sand and cobble compose the substrate beyond 3 m. The quarry spalls lack any habitat quality for salmon but may provide good ambush habitat for several species of sculpins that prey upon juvenile salmon.

5.3 Lake level

The level of Lake Washington is regulated by the Corps. The maximum allowable Lake Level was established by Congress in 1910 at an elevation of 6.7 m (22 ft) above the Lake Datum. The Corps regulates the level of Lakes Washington and Union through its operation of spillway gates at the Locks. Each winter the lake level is lowered about 0.6 m (2 ft) and held at an elevation of 6.1 m (20 ft) to provide flood control for Seattle and to reduce potential shoreline damage from winter storms. In the spring the level is raised slightly less than 0.6 m (2 ft) for the benefit of fish and summer recreation. The Corps usually lowers the lake between June and November and then raises the level between February and May (Figures 19 and 20).

5.4 Prevailing Winds

Topography plays a large role in influencing the surface wind pattern of the Puget Sound region. In the summer, winds are generally light, and from the north. In October, the surface wind becomes primarily southerly and remains in this direction throughout the winter months, with the exception of occasional strong northerly winds generated by arctic cold fronts. The average yearly wind diagram for Seattle-Tacoma Airport, and velocity-duration curves used for Lake Washington wave analysis are presented in Figures 21 and 22.

5.5 Wind Generated Waves

The Seward Park shoreline is exposed to wind waves from the south, east, and north. The proposed erosion control measures are exposed primarily to waves from the south and north. The Wind Speed Adjustment and Wave Growth application in ACES version 1.07f was used to calculate wave heights and periods for waves that approach from the major fetch directions. For the 2.5 statute-mile fetch to the south, a 67 mph wind with a 1 hr duration was calculated to generate a fetch-limited significant wave height (H_{mo}) of 4 ft with a period (T_p) of 3.7 sec. Similarly, a 48 mph wind from the north generates a somewhat smaller fetch limited significant wave height (H_{mo}) of 2.7 ft with a period (T_p) of 3.1 sec (Figures 23 and 24).

5.6 Beach Profiles

The Seward Park Shoreline was broken into six reaches based on wave exposure Figure 25. Representative transects were surveyed for each reach by the Corps of Engineers in October 1999 (Figure 5.6.1). These transects indicate that the near shore bottom has a relatively gentle (1:7 to 1:12) slope at the north and south ends of the peninsula (Reach 1 and 3) but has an exceptionally steep slope ($>1:4$), along the east and west shorelines. This survey information is consistent with NOAA navigation charts of the area (Figure 27). On the southern shore, diver observations indicate that the bottom is primarily sand, turning to gravel and cobble along the eastern shoreline. On the north shore, the natural bottom material appears to be sand, covered by angular (manufactured) rock, primarily near groins placed at the east and west corners. The bottom along the western shore is composed of sand and gravel, both natural and placed. As a result of previous shore protection efforts, the bottom in some areas along the east shoreline is covered by a layer of small quarry spalls.

The upper beach (stations +21' - +25') is a steep bank, probably created by the "cut and fill" technique used when the walkway around the park was constructed. Essentially all the this bank is "hardened" with various types of materials, including large rip rap, small rip rap, gravel, broken concrete, and concrete slabs. With minor exceptions, these measures appear to be effective in protecting the upper bank from erosion.

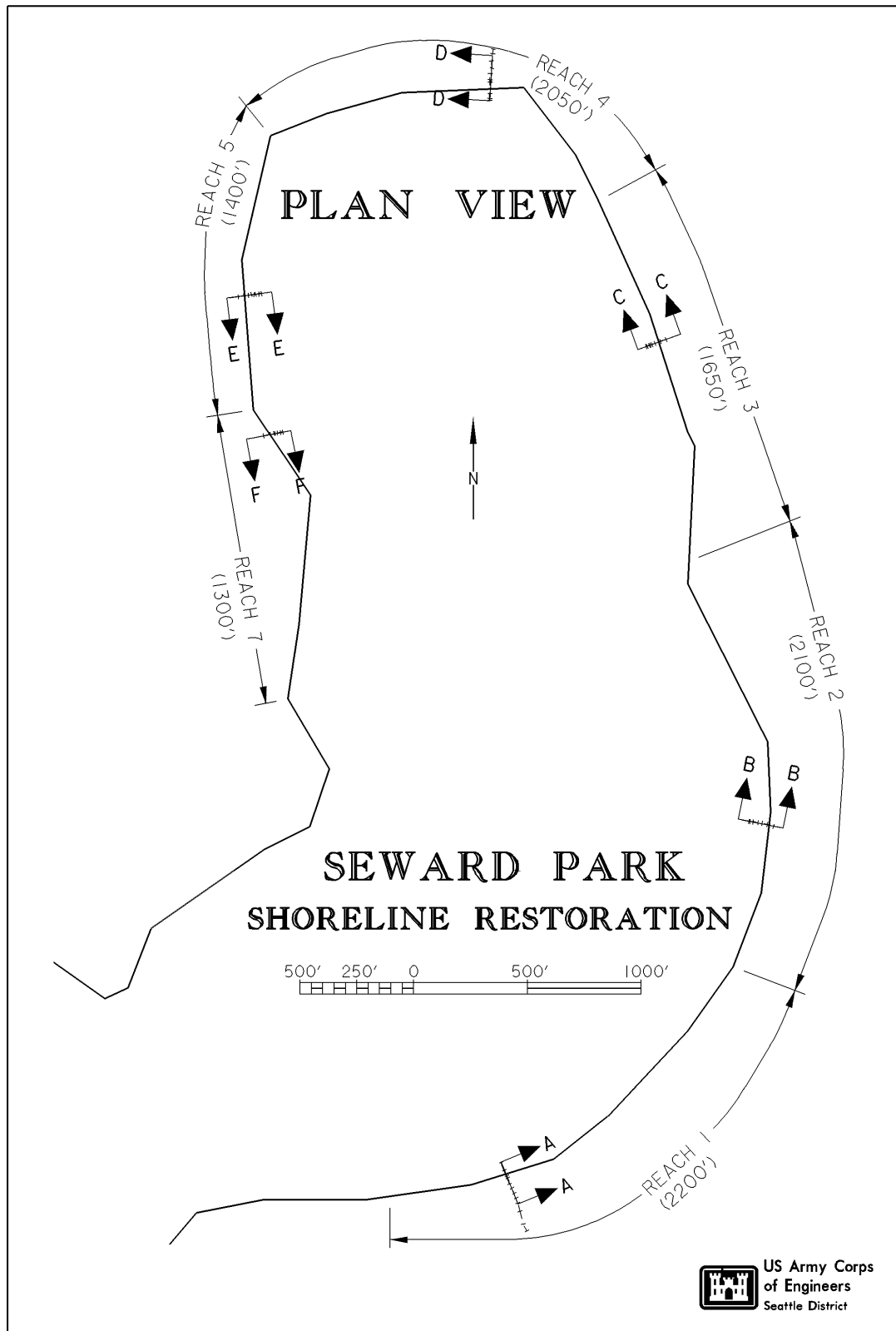


Figure 5.6.1 Seward Park Rehabilitation Site, King County, Washington, 1999-2000.

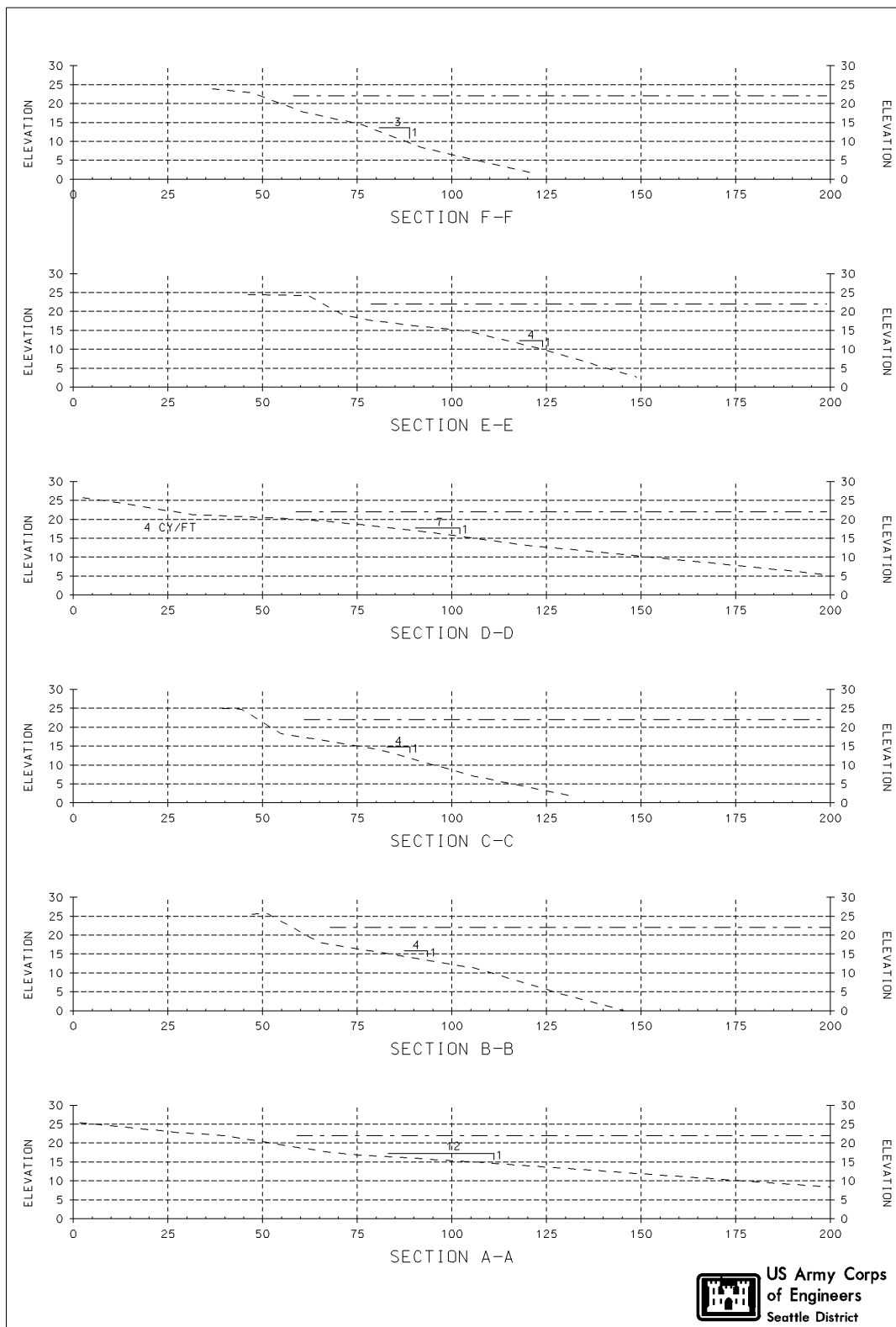


Figure 5.6.2 Transect data collected at six sites along Seward Park, King County, Washington.

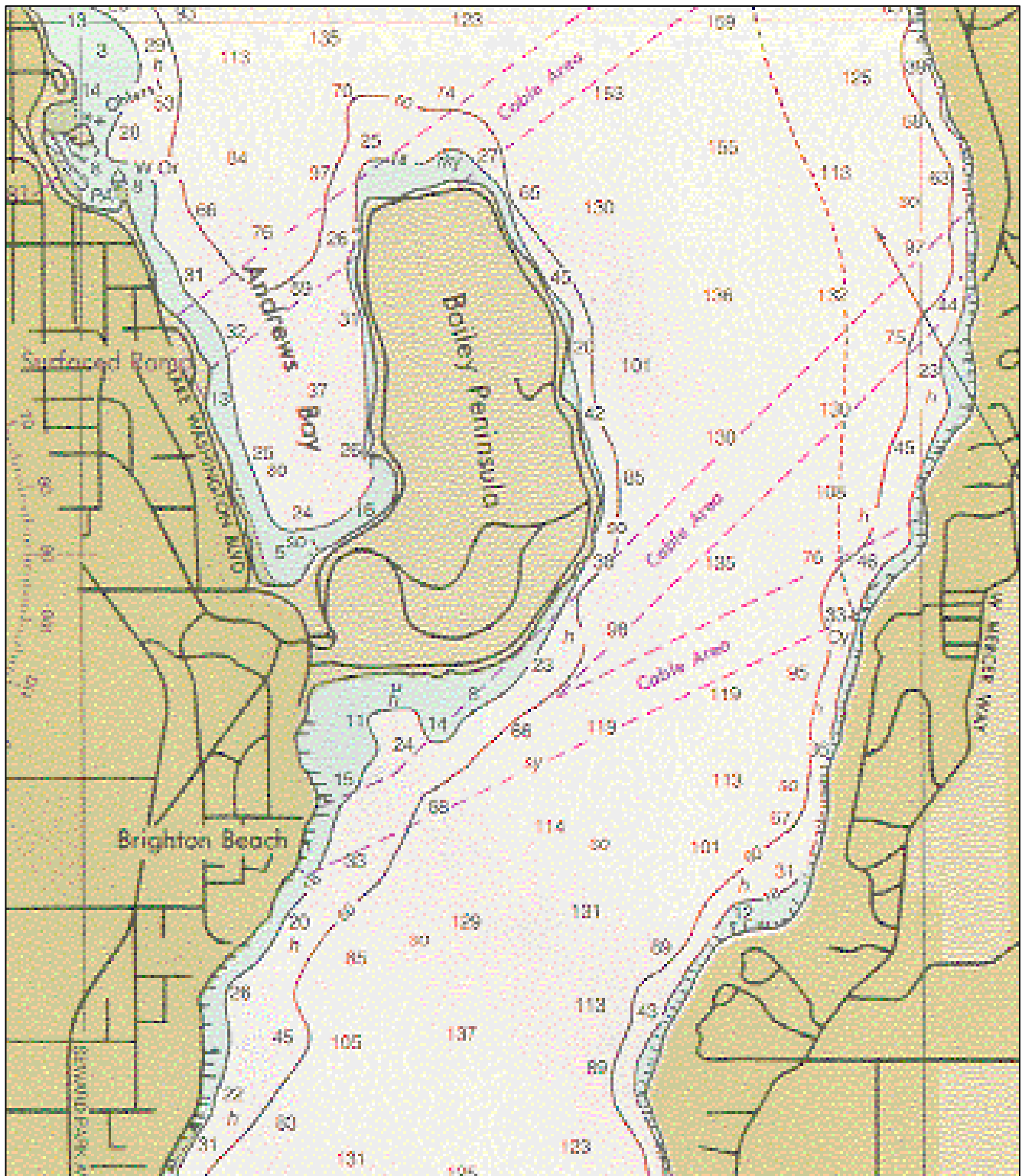


Figure 5.6.3 Bathymetric map of Lake Washington near Seward Park, King County, Washington.

5.7 Littoral Transportation

The net transport of any available littoral material would be from the south to the north due to a prevailing wind from the south. The shallow beach composed of sand at the south end of the park indicates that littoral material accretion has occurred at the south end of the park. However, the littoral processes along the Lake Washington shoreline have been modified extensively by the construction of bulkheads and piers along most of the lake shoreline and presently, the Bailey Peninsula probably receives only a minor amount of littoral material from the south. Any material that erodes from park shorelines is probably carried northward and lost permanently in deep water at the northern tip of the park. For this reason, the peninsula has always acted as an effective barrier to the movement material along the lake shoreline.

6.0 ANALYSIS OF GENERAL EFFECTS

6.1 Substrate

In several areas along the shoreline, quarry spalls have washed out into the nearshore habitat creating an "armored" substrate. Substrate is important because it has potential use as cover, spawning, and feeding habitat for juvenile salmonids. The quarry spalls lack any habitat quality for salmon but may provide good ambush habitat for several species of sculpins that prey upon juvenile salmon. Spalding (1998) indicated a change in sediment composition could cause a change in meiofauna density and that bulkheads could adversely affect benthic organisms in freshwater lakes. Another potential problem of the quarry spalls may be that it eliminates any potential sockeye spawning since it is too large to use for spawning. Piaskowski and Tabor (2001) documented that chinook appear to have a preference for a sand/gravel substrate and an avoidance for cobble or boulder substrate. The addition of the projects substrate is likely to be a substantial increase in the quality of habitat for juvenile chinook.

6.2 Invertebrates

Changing the substrate from the quarry spalls to a sandy/gravel substrate could increase the production of chironomid larvae (M. Koehler personal communication). This is especially important to chinook since pilot study work done in 1999 indicates that chinook mainly prey upon chironomids before June.

7.0 INTERDEPENDENT AND INTERRELATED EFFECTS

Interdependent and interrelated actions are actions that have no independent utility apart from the primary action. Both the interdependent and interrelated activities are assessed by applying the "but for" test, which asks whether any action and its associated impacts would occur "but for" the action. The Corps has determined that there are no interdependent or interrelated effects as a result of this project.

8.0. CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological assessment.

Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

No other future non-Federal actions were identified that could be considered cumulative effects of the action specified in this consultation.

9.0 CONSERVATION MEASURES

10.0 DETERMINATION OF EFFECT

The following determination of effects for salmon are based on the dichotomous key for making ESA determination of effects from the document "A Guide to Biological Assessment" prepared by the National Marine Fisheries Service, Washington Habitat Conservation Branch, 510 Desomond Drive SE, Suite 103, Lacey, Washington 98503.

10.1 Chinook

1. Are there any proposed/listed anadromous salmonids and/or proposed/designated critical habitat in the watershed or downstream of the watershed?

NO.....No effect

YES.....May affect, go to 2

Yes is the answer to this question. Both chinook and chinook critical habitat occur in the watershed. Therefore, proceed to question 2.

2. Does the proposed action(s) have the potential to hinder attainment of relevant properly functioning indicators (from table 2)?

A. The probability of attaining or maintaining relevant properly functioning indicators is not very high nor timely.....Likely to adversely affect

B. The probability of attaining or maintaining relevant properly functioning indicators is very high and timelyGo to 3

The purpose of this project is rehabilitation of salmon habitat. The project will maintain or restore relevant properly function indicators. Therefore, proceed to question 3.

3. Does the proposed action(s) have the potential to result in take of proposed/listed anadromous salmonids or destruction/adverse modification of proposed/designated critical habitat?

A. There is a negligible (extremely low) probability of take of proposed/listed anadromous salmonids or destruction/adverse modification of proposed/designated critical habitatNot likely to adversely affect

B. There is more than a negligible probability of take of proposed/listed anadromous salmonids or destruction/adverse modification of proposed/designated critical habitatLikely to adversely affect

A year long study conducted at project site (Paron and Nelson 2000) demonstrates that there is an extremely low probability of take for chinook salmon as they will not be present during project construction. Also, based on observations by Piaskowski and Tabor (2001) the project most likely will enhance the habitat for juvenile chinook. No critical habitat will be adversely modified. Therefore, the selection would indicate choice A - **Not likely to adversely affect.**

10.2 Bull trout

A draft document provided by the USFWS, Olympia titled "A Framework to Assist in Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Bull Trout Subpopulation Watershed Scale February 1998" was used in making a determination of effect for bull trout. The document provided a dichotomous key for making ESA determination of effects. The following questions and answers are detailed within this document.

Question 1. Are there any proposed/listed fish species and/or proposed/designated critical habitat in the watershed or downstream from the watershed?

NO.....No effect
YES (or Unknown)Go to 2

Although the likeliness of a bull trout being in the project area is extremely low, bull trout have been caught in the Cedar River and downstream of the locks. Therefore, it is possible that bull may be present in the watershed. Therefore, proceed to question 2.

Question 2. Will the proposed action(s) have any effect whatsoever on the species; designated or proposed critical habitat; seasonally or permanently occupied habitat; or unoccupied habitat necessary for the species' survival?

NO.....No effect
YES.....Go to 2

This is a tougher question to answer. Initially the answer that would come to mind would be "no." However, the USFWS definition of "any effect whatsoever" includes small effects, effects that are unlikely to occur, and beneficial effects. A "no effect" determination is only appropriate if the proposed action will literally have no effect whatsoever on the species and/or critical habitat, not a small effect, an effect that is unlikely to occur, or a beneficial effect. Since the project occurs in Lake Washington there exists a chance, even though remote, that there could be a small effect on bull trout. Therefore, the answer to question two is "yes".

Question 3. Does the proposed action(s) have potential to: result in "take" of any proposed/fish species?

NO.....Go to 4

YES.....Likely to adversely effect

The Endangered Species Act (Section 3) defines take as "to harass, harm, pursue, hunt, shoot, wound, trap, capture, collect or attempt to engage in any such conduct". The USFWS (USFWS, 1994) further defines "harm" as "significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering", and "harass" as "actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to breeding, feeding, or sheltering". As described in the "project description" section, this project is unlikely to cause harm or harassment as defined by the USFWS. Therefore, the answer to question three is "no".

Question 4. Does the proposed action(s) have potential to or cause an adverse effect to any proposed/listed fish species habitat, such as: adverse effects to critical habitat constituent elements or segments; impairing the suitability of seasonally or permanently occupied habitat; or impairing or degrading unoccupied habitat necessary for survival of the species locally?

NONot likely to adversely effect

YES.....Likely to adversely affect (including adverse effects to critical habitat)

Evaluation of the project reveals that the project will not destroy or alter bull trout habitat by dredging, diversion, in-water vehicle operation or rock removal, or other activities that result in the destruction or significant degradation of cover, channel stability, substrate composition, temperature, and migratory corridors used by bull trout for foraging, cover, migration, and spawning.

The project will not significantly disrupt behavior patterns of migrating or spawning bull trout. Nor will the project facilitate the introduction of non-native species, such as brook trout or brown trout, that may compete, hybridize with, or prey on bull trout.

The project will not discharge or release toxic chemicals, silt, or other pollutants into waters supporting bull trout that result in death or injury of the species. The project also will not destroy or alter riparian habitat that results in a significant degradation of cover, channel stability, substrate composition, temperature, and migratory corridors used by bull trout for foraging, cover, migration, and spawning.

Based on the preceding information the answer to question four would be "no". Therefore the determination would be **not likely to adversely affect**.

10.3 Bald Eagle

Direct effects may occur from increased noise levels and increased human activity. Foraging bald eagles may be temporarily displaced by the noise of heavy equipment, but the availability of prey will not be significantly disrupted by project construction. Eagles tend to tolerate more disturbances at feeding sites than in roosting areas (Steenhof 1978). Since eagles are transient in nature, they will naturally move to another perch site if disturbed (Fielder 1997). Noise and activity levels will not be much above the ambient noise and activity already present at the site.

Impacts to nesting will be insignificant since the work will occur before January 1st 2002. In Washington, most nest-building activity occurs in January and February. Egg-laying occurs in March or early April. Also, the project is far from known bald eagle nests, so if eagles were present construction activities would not directly disrupt eagle nesting and rearing of young. No communal night roosts or perch trees were affected, as none were present near the site. The bald eagles primary food stocks and foraging will be unaffected by this project. Also, no habitat was removed or degraded as a result of the flood fight.

Based on the analysis of effects (section 5.3) the Corps Seattle District has determined that the project may affect, but **not likely to adversely affect bald eagle**. The project will not have an effect on the eagle's primary food stocks and foraging area in the area influenced by the project. The project will not cause bald eagles to avoid or abandon the area nor will it remove any current or potential habitat.

11.0 EFH ANALYSIS

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires Federal agencies to consult with NMFS on activities that may adversely affect Essential Fish Habitat (EFH).

As described in this BE the Corps feels the proposed project will not have adverse impacts to designated essential fish habitat (EFH) for salmon. There are no groundfish or pelagic fish in Lake Washington, so the project would have no effect on EFH for these groups of fish. The project is designed to improved salmon habitat, therefore the Corps feels the project is not likely to adversely affect EFH.

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